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MINERALOGY OF VESICULAR OLIVINE IN THREE CK4–6 CHONDRITES: RELATIONSHIP TO SILICATE DARKENING

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Introduction: A unique feature of CK chondrites is that their chondrules and matrices show silicate darkening. Most previous workers suggested that the silicate darkening resulted from shock metamorphism [e.g., 1], but the true cause has long been unknown. Recent studies of CK4 chondrites [2–4] revealed that they contain abundant unusual olivine in their matrices, and this contains numerous micron to submicron-size vesicles and inclusions of magnetite, pentlandite, and a variety of other minerals. The authors suggested that the vesicular olivine resulted from recrystallization of partially melted olivine by shock, and this is the principal cause of the silicate darkening. Here we present the results of our mineralogical and petrological investigation of LEW 86258 (CK4), EET 87507 (CK5), and EET 87860 (CK5/6). Our purpose was to examine whether vesicular olivine is the cause of the silicate darkening in these chondrites and to determine its origin and relationship to the silicate darkening.

Results: The three CK4–6 chondrites show a similar degree of strong silicate darkening in their matrices and chondrule mesostases. Backscattered electron images of highly darkened regions in the matrices of the three chondrites show that olivine with numerous vesicles (<0.1–3 µm in diameter) fills interstices of nonvesicular olivine crystals, exhibiting a complex network of veinlets. The vesicular olivine contains numerous spherical grains (<0.1–5 µm) of magnetite and pentlandite as well as grains of plagioclase, low-Ca pyroxene and diopside, although the relative abundance of these inclusions differs between the chondrites. There is a tendency that a region having a higher volume proportion of vesicular olivine to exhibit a darker and dustier appearance in transmitted light.

Discussion: Vesicular olivine occurs pervasively in the matrices in LEW 86258, EET 87507, and EET 87860. The mineralogical characteristics of the vesicular olivine in all the chondrites closely resemble those in the Kobe and Karoonda CK4 chondrites [2–4]. From these observations, we conclude that microinclusion-rich vesicular olivine is the principal cause of the silicate darkening in the LEW 86258, EET 87507, and EET 87860 chondrites.

The internal texture of the vesicular olivine resembles that of shock-induced local melts in the matrices of carbonaceous chondrites [e.g., 5]. Thus we suggest that the vesicular olivine formed from melts that were produced from fine-grained olivine in the matrix by shock. During melting, numerous small vesicles were produced in the melts, and the melts trapped numerous droplets of melted magnetite and pentlandite as well as fragmented grains of other minerals.

References: [1] Rubin A. E. 1992. *Geochimica et Cosmochimica Acta* 56:1705–1714. [2] Tomeoka K. et al. 2001. *Meteoritics & Planetary Science* 36:1535–1545. [3] Tomeoka K. et al. 2005. *Journal of Mineralogical and Petrological Sciences* 100:116?125. [4] Ohnishi I. et al. 2007. *Journal of Mineralogical and Petrological Sciences* 102:346–351. [5] Tomeoka K. et al. 1999. *Geochimica et Cosmochimica Acta* 63:3683–3703.

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ARGON, KRYPTON, AND XENON ABUNDANCES IN THE SOLAR WIND MEASURED IN SILICON FROM THE GENESIS MISSION

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Introduction: Up to now solar wind (SW) abundances of Kr and Xe have been exclusively determined using SW irradiated regolith [1]. Hence, one of Genesis's major objectives is to obtain the heavy noble gas composition of the present-day SW using artificial targets exposed to the SW for 2.5 years. SW abundances will allow to study fractionation processes upon SW formation, e.g., due to the first ionization potential (FIP-effect) [2]. This is of importance to deduce solar abundances of noble gases and other elements from SW data. Solar, i.e., photospheric, abundances of noble gases are indirectly determined due to the lack of suitable lines in the spectrum. Recently, solar abundance estimates for Ne and Ar were strongly reduced whereas Kr and Xe changed only slightly [3]. This led to a dramatic decrease of the solar Ar/Kr ratio by a factor of ~3 from the earlier value [4] of 2140. If true, this change would invalidate theories of heavy noble gas fractionation in the SW identified with regolith data [1, 5]. The Kr and Xe composition in present-day SW will enable us to reassess solar abundances and fractionation theories. Thus, we concentrate here on abundances of Ar, Kr and Xe in the bulk SW.

Experimental: Kr and Xe are rare in the SW, expected abundances are 7×10^{-13} ccSTP/cm^2 ^{84}Kr and 9×10^{-13} ccSTP/cm^2 ^{132}Xe. Their analysis is further challenged by a possible surface contamination due to atmospheric gases. Additionally, many targets contain traces of indigenous atmospheric gases. To monitor potential atmospheric contamination, two major isotopes ^{84,86}Kr and ^{129,132}Xe will be analyzed with different abundances in the atmosphere and SW. Analyses will be carried out using CZ Si (Czochralski-pulled Si), considered to be one of the purest target materials flown on Genesis. Noble gases will be extracted from ~1 cm^2 by UV laser ablation (213 nm). A beam size of 200 µm, the maximum repetition rate of 20 Hz and a raster speed of 1 mm/s will allow a complete extraction of solar wind particles from this large area within ~40 min. Extraction line and mass spectrometer blanks are 8×10^{-16} ccSTP ^{84}Kr and 6×10^{-16} ccSTP ^{132}Xe, thus contributing only 0.1% and 0.6% to expected Kr and Xe amounts, respectively. More crucial is, however, the material blank. One first CZ Si measurement resulted in 1.13×10^{-14} ccSTP ^{132}Xe/cm^2 [6], corresponding to ~11% blank contribution to expected SW Xe. This value, however, may be an overestimate due to suboptimal experimental conditions [S. A. Crowter, personal communication 2008]. Daily mass spectrometer performance is controlled by a highly diluted (10^{-13}–10^{-12} ccSTP) Kr, Xe calibration to keep the Kr and Xe memory in the mass spectrometer low. Sensitivity for Kr and Xe is $1 \times 10^{+15}$ and $1.3 \times 10^{+15}$ counts/ccSTP, respectively.

At the conference we will present the Ar/Kr and Kr/Xe composition of the bulk solar wind.

References: [1] Wieler R. and Baur H. 1995. *The Astrophysical Journal* 453:987. [2] von Steiger R. et al. 2000. *Journal of Geophysical Research* 105:27,217. [3] Asplund M. et al. 2005. ASP 336. p. 25. [4] Anders E. and Grevesse N. 1989. *Geochimica et Cosmochimica Acta* 53:197. [5] Heber V. S. et al. 2001. AIP 598. Bern, Switzerland, 387. [6] Crowter S. A. et al. 2008. 39th LPSC. Abstract #1762.